

(19) World Intellectual Property  
Organization  
International Bureau



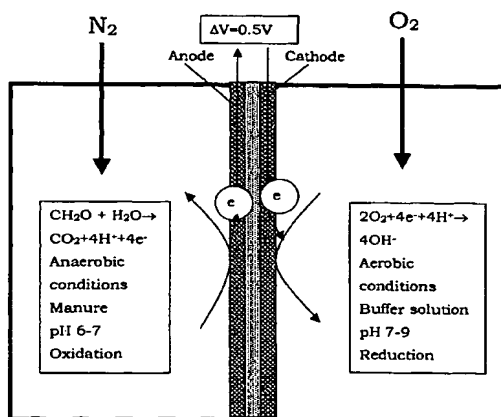
(43) International Publication Date  
8 January 2004 (08.01.2004)

PCT

(10) International Publication Number  
**WO 2004/004036 A3**

- (51) International Patent Classification<sup>7</sup>: **H01M 8/16**, 8/22, 8/08
- (21) International Application Number:  
PCT/NL2003/000482
- (22) International Filing Date: 30 June 2003 (30.06.2003)
- (25) Filing Language: Dutch
- (26) Publication Language: English
- (30) Priority Data:  
1020965 28 June 2002 (28.06.2002) NL
- (71) Applicant (for all designated States except US): NEDERLANDSE ORGANISATIE VOOR TOEGEPAST-NATUURWETENSCHAPPELIJK ONDERZOEK TNO [NL/NL]; Schoemakerstraat 97, NL-2628 VK Delft (NL).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): GERRITSE, Jan [NL/NL]; Oude Beekbergerweg 109, NL-7331 HN Apeldoorn (NL). SAAKES, Machiel [NL/NL]; Generaal van der Heydenlaan 3, NL-7316 BC Apeldoorn (NL). STAMS, Alfons, Johannes, Maria [NL/NL]; Gerdessastraat 8, NL-6701 AK Wageningen (NL).
- (54) Title: BIOFUEL CELL
- (81) Designated States (national): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK (utility model), SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— with international search report

[Continued on next page]



(57) Abstract: The invention relates to a method for processing organic waste in an environmentally friendly manner, and to a device suitable thereto. According to the invention, the waste flow is processed in a bipolar biofuel cell. To this end, the waste is introduced into a space in which a pair of electrodes is present, which pair of electrodes comprises at least one anode and at least one cathode, while in a bipolar cell the anode and cathode are separated spatially and/or by a porous, electronically non-conductive, non-ion-selective wall, while an oxidizer is introduced in the space around the cathode, and where a potential difference is formed across said pair of electrodes such that at the anode CO<sub>2</sub> is produced and that electricity is produced. The method according to the invention can be carried out with waste flows comprising animal manure, waste water, waste water purification sludge, kitchen and garden waste (KGW), roadside grass, residual flows from industrial processes (such as molasses, whey, draff) and/or dredgings.



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**(88) Date of publication of the international search report:**  
1 April 2004

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 03/00482

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01M8/16 H01M8/22 H01M8/08

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 43 45 148 A (SCHNORR WOLFGANG) 22 December 1994 (1994-12-22)	1,2,7
A	column 8, line 35 - line 46; claims 1-23; figure 1	3-6,8-22
X	WO 01 04061 A (KOREA INST SCIENCE TECHNOLOGY ;KIM BYUNGHONG (KR); PARK HYUNGSOO ( ) 18 January 2001 (2001-01-18) the whole document	1,2,7
X	HABERMANN W ET AL: "BIOLOGICAL FUEL CELLS WITH SULPHIDE STORAGE CAPACITY" APPLIED MICROBIOLOGY AND BIOTECHNOLOGY, SPRINGER VERLAG, BERLIN, DE, vol. 35, no. 1, 1991, pages 128-133, XP000862908 ISSN: 0175-7598 the whole document	21
-/--		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*G\* document member of the same patent family

Date of the actual completion of the international search

26 January 2004

Date of mailing of the international search report

02/02/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Battistig, M

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 03/00482

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 981 803 A (THOMAS GRAY YOUNG) 27 January 1965 (1965-01-27) claims 1-14 ---	1,2,7
X	EP 0 827 229 A (KOREA INST SCIENCE TECHNOLOGY) 4 March 1998 (1998-03-04) page 3, line 40 -page 5, line 47; claims 1-8 -----	21

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/NL 03/00482

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 4345148	A	22-12-1994	DE 4223577 A1	20-01-1994
			DE 4345148 A1	22-12-1994
WO 0104061	A	18-01-2001	KR 2001009031 A	05-02-2001
			AU 3333500 A	30-01-2001
			CA 2378558 A1	18-01-2001
			CN 1364146 T	14-08-2002
			EP 1232123 A1	21-08-2002
			WO 0104061 A1	18-01-2001
GB 981803	A	27-01-1965	NONE	
EP 0827229	A	04-03-1998	KR 224381 B1	15-10-1999
			EP 0827229 A2	04-03-1998
			JP 3022431 B2	21-03-2000
			JP 10233226 A	02-09-1998
			US 5976719 A	02-11-1999